NOTES AND NEWS

CHROMOSOME NUMBERS AND RELATIONSHIPS OF CLAYTONIA SAXOSA AND C. ARENICOLA (PORTULACACEAE).—*Claytonia saxosa* Brandegee and *C. arenicola* Henderson are rather uncommon and poorly understood taxa of western North America. Their chromosome numbers, reported here for the first time, as well as morphological observations, provide evidence for suggestions on possible relationships with other species of *Claytonia* sect. *Limnia*. Current studies of the *C. perfoliata* Donn and *C. spathulata* Hook. complexes of sect. *Limnia* reveal parallel variation in a number of the vegetative morphological features traditionally used to define these species (Miller, Syst. Bot. 1:20–34. 1976; Fellows, Madroño 23: 296–297. 1976). This work suggests that relationships are better expressed by chromosome base number and floral features, especially the surface of the seed coat. Our purpose is to report the chromosome numbers of *C. arenicola* and *C. saxosa* and to suggest, from correlations with seed morphology and other traits, how the relationships shown by previous studies may be revised.

Two recent reviewers of infrageneric relationships in *Claytonia* (Swanson, Brittonia 18:299–241. 1966; McNeill, Canad. J. Bot. 53:789–809. 1975) have placed *C. saxosa* and *C. arenicola* in sect. *Limnia,* together with the other annual species *C. perfoliata, C. spathulata,* and *C. gypsophiloides* F. & M. McNeill put in sect. *Limnia* the perennials *C. sibirica* L. and *C. heterophylla* (T. & G.) Swanson, whereas Swanson assigned these taxa to two other sections. Most of the clustering methods used by McNeill in his numerical taxonomic analysis placed *C. sibirica* and *C. heterophylla* as a closely allied pair, adjacent to—but somewhat removed from—the cluster formed by the five other species mentioned above. In the several dendrograms presented by McNeill, *C. arenicola* links directly to the pair formed by *C. spathulata* and *C. gypsophiloides*. A close morphological tie between these three is also evident in McNeill's plot (his fig. 8) of the first two axes in a principal-coordinates analysis of sects. *Limnia* and *Rhizomatosae*. On this plot, *C. sibirica* and *C. heterophylla* are in a more distant position, intermediate toward sect. *Rhizomatosae*. *Claytonia saxosa* links directly to *C. perfoliata* in several of McNeill's dendrograms but in the plot just cited, it stands alone, about equidistant from *C. perfoliata* and *C. spathulata*.

Our studies show that *Claytonia arenicola* is diploid, with $x = 6$ ($2n = 12$; ID, Adams Co., Hells Canyon, 13.4 km upriver from Hells Canyon Dam, *Miller 496*; OR, Wallowa Co., Hells Canyon, 1.5 km below Hells Canyon Dam, *Miller 499;* WA, Asotin Co., Clarkston, 6 km W on S side of the Snake R., *Miller 493*). This is the same as the base number found in *C. sibirica* (Lewis, Bot. Rev. 33:105–115. 1975). The flowers of *C. arenicola* are virtually indistinguishable from those of *C. sibirica,* being protandrous with a showy corolla of "candy-striped" white or pinkish petals 5–10 mm long. Its breeding system, like that of *C. sibirica* (Swanson, Ph.D. Dissertation, Univ. California, Berkeley, p. 59. 1964), appears to be one of obligate outcrossing, since plants that flowered in an insect-free greenhouse set no seeds spontaneously. The inflorescence of *C. arenicola* resembles that of *C. sibirica* in having a bract by each pedicel of the raceme. Mature seeds of the species have a low-tubercled surface similar to that of *C. sibirica* but distinctly different from the more prominently tubercled seeds of *C. spathulata* and *C. gypsophiloides*. Unlike the dull-surfaced seeds of *C. gypsophiloides* and *C. spathulata,* the seeds of *C. sibirica, C. arenicola,* and *C. perfoliata* show a "shiny highlight" when illuminated. Therefore, *C. arenicola* differs significantly from *C. spathulata* and *C. gypsophiloides,* which have a base chromosome number of $x = 8$ (Fellows, loc. cit.; Lewis, Ann. Missouri Bot. Gard. 54:180. 1967; Nilsson, Bot. Not. 119:464–468. 1966), and in which the racemes have only a single bract at the base. *Claytonia perfoliata* has a chromosome base number of $x = 6$ (Fellows, loc. cit.; Miller, loc. cit.; Swanson, op. cit.) but it varies from *C. arenicola* in its consistently small, self-pollinating flowers and its racemes, which are bracteate only at the base. If special weight is

given to the above characteristics, therefore, *C. arenicola* appears to be more closely related to *C. sibirica* than to either the *C. perfoliata* or the *C. spathulata-gypsophiloides* complexes.

Claytonia saxosa is diploid with $x = 8$ ($2n = 16$; CA, Siskiyou Co., Scott Valley, mouth of Heartstrand Gulch, *Miller 488*). Its corollas are showy, with pink petals 6–8 mm long, and the species is putatively outcrossing, as one would also suspect of the large-flowered, diploid *C. gypsophiloides*. In the material of *C. saxosa* we have examined, the racemes are completely ebracteate (contrary to a statement in the key by McNeill, op. cit., p. 801). The seed coat of *C. saxosa* is prominently tubercled and dull-surfaced as in *C. spathulata* and *C. gypsophiloides,* although the shape of the tubercules is slightly different. Although paired with *C. perfoliata* in some of the numerical analyses reported by McNeill (op. cit.), *C. saxosa* seems to be relatively more distant from that species than it is from *C. gypsophiloides* and *C. spathulata,* if one assumes that chromosome number and seed coat morphology are conservative indicators of genetic relationship.

Voucher specimens and permanent microslides for the chromosome counts reported in this study are deposited in OSC. —John M. Miller and Kenton L. Chambers, Department of Botany and Plant Pathology, Oregon State University, Corvallis 97331.

On the Relationships of Chenopodium flabellifolium and C. inamoenum.— Taxonomists have disagreed on the treatment of *C. inamoenum* Standley (North Amer. Flora 21:1–93. 1916; type: Arizona-Mexico border near Douglas, *Mearns 2286,* US) and *C. flabellifolium* Standley (op. cit.; type: Baja California, San Martín Island, 1897, *T. S. Brandegee s.n.,* UC 116454).

Standley placed *C. inamoenum* in "group" Leptophylla together with several other species. One of the species was *C. hians* Standley (op. cit.; type: near Dulce, New Mexico, 1911, *Standley 8129,* US). Another species included in this group was *C. leptophyllum* (Nutt. ex Moq.) S. Wats., which was originally described as *C. album* var. *leptophyllum* Nutt. ex Moq. [DeCandolle, Prod. 13(2):71. 1849; type: *Gordon 260,* K, with the locality given as LaPlatte (on the Platte River?)]. Aellen and Just (Amer. Midl. Naturalist 30:47–76. 1943) considered *C. inamoenum* to be the same as *C. leptophyllum*. Wahl (Bartonia 27: 1–46. 1952–53) commented that the type of the former "does not agree with any material seen". Examination of the type specimen reveals that it is the top of a plant with what appear to be few primary leaves and with many seeds. The seeds (actually fruits, since the pericarp is attached) of the type closely resemble those of *C. leptophyllum* in being 1.0 mm or less in diameter and with black pericarps. A couple of what I interpret as primary leaves have two very weakly developed veins. *Chenopodium hians* typically has leaves oblong to linear in outline with a midrib and two well developed lateral veins whereas the leaves of *C. leptophyllum* bear only a strong midrib and no discernable lateral veins. While no definitive conclusion can be reached regarding the type of *C. inamoenum,* the seed characters are strong evidence for its being considered as nearer to *C. leptophyllum*.

Chenopodium flabellifolium was viewed by Standley (op. cit.) as closely related to the *C. neomexicanum* complex, since he placed it in his "group" Fremontiana with several other species having basally lobed leaves. These other taxa included *C. neomexicanum* Standley, *C. arizonicum* Standley, *C. palmeri* Standley, and *C. parryi* Standley, all of which he described in this same paper in 1916. In an earlier paper (Madroño 22:185–195. 1973), I considered the types of these names to be conspecific, and *C. lenticulare* Aellen, (Feddes Repert. Spec. Nov. Regni Veg. 26:31–64, 119–160. 1929) was likewise considered to belong to the same species. Whereas Standley considered *C. flabellifolium* to be related to *C. neomexicanum,* Aellen and Just (op. cit.) placed the former in synonymy under *C. opulifolium,* which is a sparingly introduced European species (Schrader in Koch and Ziz, Cat.